

IN THE MATTER OF

United States Patent Application No. 09/691,583

in the name of

Neil Maxwell McLachlan *et al*

Declaration

I, **Dr Thomas D. Rossing**, of DeKalb, Illinois, United States of America do solemnly and sincerely declare as follows:

1. I am a Professor Emeritus of Physics at Northern Illinois University. My short-form Curriculum Vitae is appended hereto.
2. I am author of a number of 12 books and more than 300 published papers on the subject of musical acoustics and physics relating to musical acoustics. A number of these relates specifically to the acoustics of bells.
3. I have read and understand the patent application 09/691,583 entitled 'Improvements in or relating to bells' to N McLachlan *et al*, and I have been asked to provide comment in respect of the concept of the 'harmonic bell', and of the place of this concept in musical acoustics.
4. It has conventionally been understood that the limited musical application of bells has been at least partly due to the inharmonic partial tones in the lower part of their acoustic spectra. Bells and gongs do not naturally produce purely harmonic overtones because, unlike air columns (such as in brass or wind instruments) and instrument strings, which vibrate predominantly in one dimension only, bells vibrate flexurally - in three dimensions. I believe that there has been for many decades a real need for a bell with effective harmonic timbral qualities, and that such a bell is likely to find musical application in many contexts, such as in musical education, in musical ensembles, in small carillons, and in orchestras (for which composers may be more likely to include the instrument in future). In particular, tuned percussion instruments are ideal for music education in schools due to their robust character and ease of use. There exists a large market for affordable, well-tuned percussion instruments such as harmonic bells to expand the available instrumental resources in this area.
5. The vibrations of bells are extremely difficult to describe analytically, and I understand that it is common to use numerical methods such as Finite Element Analysis (FEA) to predict the behaviour of bells. Using FEA techniques and suitable optimisation techniques, major third carillons have been successfully designed in the past, but to the best of my knowledge the harmonic bell has not been hitherto achievable.

DECLARATION

6. I believe that the technical solution to the 'harmonic bell problem' has in the past eluded those who may have attempted to achieve it. To the best of my knowledge, the technique described in the '583 patent specification, of choosing a starting geometry in which the lower frequency modes to be tuned by shape optimisation were purely circumferential modes (which has been an essential part of the success of solving the problem) is a novel one.
7. I believe that the inventors have indeed created a new musical instrument that represents a substantial departure and will have wide and novel applications in the musical world. They have applied sound scientific techniques to further the state of the art and to create a novel solution to an old problem.

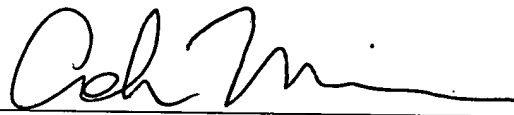
I am aware that willful false statements and the like are punishable by fine or imprisonment, or both under 18 U.S.C. 1001. All statements that are based upon my own knowledge are true, and all statements made on information and belief are believed to be true.

DECLARED AT

this ..14th..... day of JUNE, 2004


Dr Thomas D. Rossing

In the presence of:



Curriculum Vitae

Thomas D. Rossing



B.A., Luther College, 1950

M.S., Iowa State University, 1952

Ph.D., Iowa State University, 1954

1954-57:	Research Physicist, UNIVAC Division, Sperry Rand
1957-71:	Professor of Physics, St. Olaf College (Dept. Chairman 1963-69)
1971- :	Professor of Physics, Northern Illinois University (Dept. Chairman 1971-73)
	Distinguished Research Professor, 1987-
1961-62:	Microwave Laboratory, Stanford University
1963 (Summer):	Lincoln Laboratory, Massachusetts Institute of Technology
1966-67:	Clarendon Laboratory, Oxford University, England
1974, 1975 (Summers):	Faculty Research Participant, Argonne National Laboratory
1974-76:	Resident Research Associate, Argonne National Laboratory
1976-77:	Physics Department, Massachusetts Institute of Technology
1978 (Summer):	Massachusetts Institute of Technology
1980-81:	Visiting Lecturer, University of New England, Armidale, Australia
1983-85 (Summers):	Department of Speech Communication and Music Acoustics, Royal Institute of Technology (KTH), Stockholm, Sweden
1984, 1985 (Summers):	Institute for Perception Research, Eindhoven, The Netherlands
1984-87:	Sigma Xi National Lecturer
1988:	Visiting Exchange Scholar, P. R. China
1988-89:	Guest Researcher, Physikalisch-Technische Bundesanstalt, Braunschweig, Germany
1990-98 :	Scientist-in-Residence, Argonne National Laboratory
1998:	Guest Researcher, Fraunhofer Institut, Stuttgart, Germany
2003:	Visiting Professor, Edinburgh University, Scotland

Professional Society Memberships: American Physical Society (Fellow), American Association of Physics Teachers (President, 1991), Acoustical Society of America (Fellow), American Association for the Advancement of Science (Fellow), Acoustical Society of India (Honorary Fellow), Institute of Electrical and Electronic Engineers, Catgut Acoustical Society, Percussive Arts Society, Sigma Xi, Sigma Pi Sigma, Guild of American Luthiers, Materials Research Society

Areas of Research: Musical acoustics, psychoacoustics, speech and singing, vibration analysis, magnetic levitation, environmental noise control, surface effects in fusion reactors, spin waves in metals, physics education.

Author of more than 350 publications (including 15 books, 9 U.S. and 11 foreign patents), mainly in acoustics, solid state physics, magnetism, environmental noise control, and physics education.